

Section 535—Painting Structures

535.1 General Description

This work consists of painting new and existing steel structures, steel H-piling and metal shell piling, and steel swaybracing. The work includes applying special protective coatings to piling and swaybracing, complete in place. The work also includes protecting traffic and property.

535.1.01 Definitions

SSPC: Steel Structure Painting Council

535.1.02 Related References

A. Standard Specifications

[Section 107—Legal Regulations and Responsibility to the Public](#)

[Section 501—Steel Structures](#)

[Section 520—Piling](#)

[Section 647—Traffic Signal Installation](#)

[Section 870—Paint](#)

B. Referenced Documents

SSPC Guide 6I (CON), Class 3, 1992 edition

SSPC Guide 7I (DIS), Section 5

SSPC-SP6, “Commercial Blast Cleaning”

SSPC-SP7, “Brush-Off Blast Cleaning”

OSHA Standards 29 CFR 1910 and 29 CFR 1926

Toxicity Characteristic Leaching Procedure (TCLP)

EPA “Uniform Hazardous Waste Manifest”

535.1.03 Submittals

At least 4 weeks before beginning the work, make the following submittals to the Engineer for approval:

A. Health and Safety Responsibilities

Provide effective engineering and work practice controls to protect employee health and safety.

1. Comply with all relevant Environmental Protection Agency (EPA), Resource Conservation and Recovery Act (RCRA), Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), Occupational Safety and Health Act (OSHA), and Environmental Protection Division (EPD) Regulations.
2. Certify to the Engineer that personnel involved with lead paint removal operations (including rigging and material handling personnel) have received training and understand the applicable parts of the latest edition of OSHA Standards 29 CFR 1910 and 29 CFR 1926, including any amendments. Have the certification signed by all personnel involved with lead paint removal.
3. Provide test results from an OSHA Certified Laboratory showing blood lead levels of employees that may be exposed to lead during the Project.
4. Provide a medical monitoring schedule to verify acceptable blood lead levels during the Project and after the Project is completed.

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B. Blast Cleaning Containment System

1. Before beginning work at each bridge, submit design and drawings of the proposed containment system to the Engineer for review and approval. Include tarpaulin data sheets to verify that the material is airtight, and tightly secured at the seams. Do not use burlap or open weave materials.
2. When the proposed containment system will induce large loads on the existing structure, the Engineer may direct the Contractor to submit an analysis of the load that will be added to the existing structure by the containment system and blast waste. Have a licensed Professional Engineer registered in the State of Georgia with bridge experience perform and stamp the load analysis. Ensure that the analysis shows that the system will not induce a load on the bridge that overstresses it or affects the structural integrity of the bridge.
3. Do not allow the containment system or equipment to violate the minimum bridge clearances shown on the Plans, unless otherwise approved by the Engineer.

C. Emergency Contingency Plan

Submit to the Engineer for review and approval an emergency contingency plan for cleaning up spills from failure of the containment system, spent material recovery system, or storage containers. Define procedures for spills or releases of waste and indicate the training of workers handling the waste as required by RCRA.

D. Spent Material Sampling Plan

Submit in writing to the Engineer for review and approval the proposed method for collecting the spent material. Include a sampling plan that conforms to EPA SW849 or a statement of intent to use the DOT sampling plan ([Subsection 535.3.03.B.9](#)). This submittal will also include the name of the company(ies) and responsible person(s) that will sample, treat, and haul the spent material.

E. Material Safety Data Sheets

Submit Material Safety Data Sheets on the abrasive and paint materials that will be used.

F. Hazardous Waste Transporter Information

Provide the name and EPA identification number of each licensed Transporter used for shipping hazardous waste to a treatment, storage, or disposal facility.

G. Permitted Site Information

Provide the name and EPA identification number, phone number, and address for each permitted off-site treatment, storage, or disposal facility to which the waste will be shipped.

H. Accredited Laboratory Information

Provide the name of the Environmental Lead Laboratory Accreditation Program (ELLAP) accredited laboratory that will perform the TCLP tests.

The Engineer will forward a copy of these submittals to the Office of Materials and Research for review.

535.2 Materials

Ensure that materials meet the requirements of the following Specifications:

Material	Section
Abrasives for Blast Cleaning	Note 1*
Paint	870

Note 1*

Use low dusting mineral abrasives which contain a minimum of ten percent (10%) by weight G-80 steel grit blended homogeneously throughout the blasting abrasive or 100% steel grit. Alternate abrasive mixtures proposed by the Contractor require approval by the Office of Materials and Research before use. Abrasives shall contain no more than 100 ppm of any corrosive compound such as sulfate or chloride. Abrasives shall not contain EPA characteristic compounds such as lead, chromium, or arsenic which can be detected by the EPA Toxicity Characteristic Leaching Procedure (TCLP). The mineral abrasive used to blend with steel grit will be listed in the Department's Qualified Products Manual.

535.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

535.3 Construction Requirements

535.3.01 Personnel

A. Contractor Certification

Ensure that no Contractor performs work on this Item who is not certified.

To become certified to remove lead paint, either:

- Attend a Departmental Structural Steel Painting Workshop
- Be SSPC certified for hazardous paint removal according to the SSPC-QP2 Contractor Certification Program

Have certified structural steel painting supervisors onsite during Project lead paint removal or spent materials activities (collecting, storing, separating, treating, and moving spent materials).

535.3.02 Equipment

A. Brushes

Preferably, use brushes with round or oval cross sections. If using flat brushes, ensure that the maximum width is 4 in (100 mm).

For surfaces inaccessible to brushes, apply paint with sheepskin daubers made for painting.

Application of inorganic zinc by brush is prohibited except for small areas and touch up work.

B. Spray Equipment

If spraying paint, use air, cold airless, or hot circulating airless equipment. Spray equipment is subject to the Engineer's approval.

Use spray equipment that can constantly agitate the paint. Also, use equipment with a device that thoroughly mixes paints in their shipping containers before the paints are removed.

Water traps are required as follows:

- When using air spray equipment, ensure that the air lines in the system have suitable water traps.
- For cold airless spray equipment, water traps are not required in the air lines; use them if desired.

C. Rollers

Rollers are subject to the Engineer's approval.

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Use rollers suitable to the type of paint applied and the work areas involved. Provide pans for dipping the rollers into the paint.

Follow these restrictions:

- Do not use worn rollers.
- Do not use rollers to apply special protective coatings or paints to piling and swaybracing.
- If a surface is inaccessible to rollers, apply the paint with sheepskin daubers made for painting.

D. Inspection Equipment

Ensure that the system applicator has the following:

- Wet-film gauge
- Dry-film gauge
- Surface thermometer
- Sling psychrometer
- Abrasive blasting finish gauge

During and after field cleaning and painting, furnish a safety belt and a lift truck, bucket truck, or snooper truck to the Engineer's satisfaction to inspect the cleaning and painting operation.

E. Protection Equipment

Furnish signs, warning lights, barricades, enclosures, and watchmen as required by the Manual on Uniform Traffic Control Devices or by the Engineer.

535.3.03 Preparation

Refer to Subsection [535.3.05B.1, "weather conditions"](#) before performing any cleaning operations.

A. Clean New Steel Structures

Before painting, clean new steel structures as follows:

1. Clean steel H-piling, metal shell piling, and steel swaybracing.
2. Field blast clean steel H-piling, metal shell piling, and steel swaybracing that will receive paints systems or special protective coatings by field blasting. The extent of cleaning shall be SSPC-SP6, "Commercial Blast Cleaning."
3. Thoroughly shop clean the following structural steel metal surfaces to be painted. The extent of cleaning shall be SSPC-SP6, "Commercial Blast Cleaning."
4. Clean field weld or bolted connection surfaces as follows:
 - a. Before cleaning the steel, straighten bent metal according to [Subsection 501.3.05.A, "Straightening Material."](#)
 - a. Before welding or bolting, field clean the surfaces that will touch after the welding or bolting as described in [Subsection 535.3.03.A, "Clean New Steel Structures,"](#) step 1 and step 2.
 - b. Keep the surfaces free of paint and metal spatters.
 - c. Field clean the remainder of the structural steel.

If desired, delay cleaning the rest of the structural steel until concrete work is complete and the main painting operation is ready to begin.
5. Prepare new steel structure surfaces for painting as follows:
 - a. Have the Engineer inspect each span or unit of work.
 - b. Do not begin painting until the Engineer approves the spans or units of work.

B. Clean Existing Steel Structures

Ensure that no work is performed before a Project Bridge Painting /Repainting Pre-Construction Conference is held.

Clean only as much metal as can be painted before it rusts. If surfaces rust after cleaning, clean them again before painting them.

Blast clean existing steel structures as follows:

1. Construct protection devices. Assume responsibility for damages to vehicles, persons, or property caused by cleaning operations.

Protect the following from blast-cleaning hazards:

- Portions of the structure (superstructure, substructure, and highway appurtenances) that could be damaged by the blast cleaning
- Existing pedestrian, vehicular, and other traffic on, underneath, or adjacent to the structure

Construct protection devices as follows:

- a. Cover or shield portions of the structure that could be damaged.
- b. Construct a system that protects traffic from direct blasting and prevents abrasive materials and debris from spreading and creating a traffic hazard.
- c. If blast cleaning disrupts traffic flow, stop cleaning or clean behind screens.
- d. If the protection devices are not providing protection, stop the work and correct the problem.
Do not begin work until effective corrections are made.
- e. Before reopening work areas to traffic, remove abrasive material and debris deposited on the pavement, shoulders, or slope paving in the area.

2. Prepare the structures for blast cleaning as follows:

- a. If the Project Inspector requires, remove railings, nameplates, and other interfering parts from surfaces to be cleaned and painted.
- b. Straighten bent metal.
- c. Before blast cleaning a beam or girder, remove dust and debris from the top of the bottom flange.

3. Remove all coats of paint to clean, bare metal by blast cleaning or other approved means.

The extent of cleaning shall be SSPC-SP6, "Commercial Blast Cleaning," with an anchor pattern between 1.0 and 2.0 mils (0.025 and 0.051 mm). Anchor patterns greater than 2.0 mils (0.051 mm) will require that the primer be applied at a thickness of at least 1 mil (0.025 mm) over the anchor pattern or that the steel be re-blasted unless otherwise approved by the Engineer.

4. After blast cleaning and before painting, prepare the steel surfaces as follows:

- a. Remove sand, dust, and other foreign matter from the following:
 - Deck
 - Piers
 - Railing
 - Other adjoining parts of the structure
 - Slope paving
- b. Remove any fins, tears, or slivers from the steel.
- c. Remove burred or sharp edges that appear on any steel members.
- d. Have the Engineer inspect each span or unit of work.

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- e. Do not begin painting until the Engineer approves the spans or units of work.
5. Contain the paint chips, abrasive particles, and dust or debris (spent material) caused by cleaning and blasting as follows:
 - a. Contain spent material according to the 1992 edition of SSPC Guide 6I (CON), Class 3. The containment materials and support structure may be flexible or rigid.
 - b. Ensure that tarpaulins are airtight and secure at the seams.
 - c. Do not use burlap or open-weave materials.
 - d. Seal seams and joints by taping or overlapping tarps at least 24 in (600 mm). Overlap the entryway at least 3 ft (1 m).
 - e. Use negative pressure and verify it as follows:
 - Verify pressure through the concave nature of the containment materials, taking into account wind effects.
 - Observe air flow using smoke or other visible means inside or outside the containment.
 - f. Filter the air exhausting from the containment with a properly sized dust collector, bag house, or other approved method.
 - g. During abrasive blasting operations, ensure that the cross-draft and downdraft air movements within the containment comply with OSHA Standard 29 CFR 1910.94.
6. Additional blast-cleaning requirements for bridges over waterways:
 - a. Ensure that there is no scum on the surface of the water outside a 200 ft (60 m) limit of the bridge. Stretch a floating boom across the waterway at or before this 200 ft (60 m) limit on the downstream and downwind sides of the bridge to contain floating spent material.
 - b. If floating residue is found outside this 200 ft (60 m) limit, the Engineer will consider protection inadequate and will require further containment measures.
 - c. If the wind velocity is high enough to blow the residue outside the 200 ft (60 m) limit, the Engineer will temporarily suspend the blast cleaning.
 - d. Provide a flotation device in the water underneath the area being blast cleaned to collect the spent material.
 - e. If the stream is too shallow for a barge, erect a temporary platform or tarp arrangement to collect the spent material.

7. Alternate Containment System

If desired, propose an alternate method for containing the dust and spent materials from blast cleaning the structural steel.

The Department may reject a proposed alternate method that does not satisfy the Department's concerns for the safe removal and containment of lead-based paint from bridge structures.

Submit the proposal for evaluation and approval as follows:

- a. Submit a detailed, written proposal describing the alternate containment and blasting method.
- b. Include in the description specific information on materials and equipment, noise levels, and worker safety and health.
- c. Supply references of other locations where the alternate method has been used.
- d. The Department will review the information submitted and may reject the proposal or issue a conditional approval.
- e. If the Department grants conditional approval, demonstrate the alternate method for containment and blast cleaning on a trial basis.

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- 1) The Department will evaluate the effectiveness of dust and spent material containment, worker safety and health concerns, and noise levels.
- 2) If the Department finds the alternate method unacceptable, the Department may reject it and require work according to this Specification.
- 3) If the Department approves the alternate method, the Contractor will receive no additional payment above the established Contract Unit Price.

8. Handling Spent Materials

Handle spent materials according to the following requirements:

- a. Collect the spent material daily and store it in sealed waste disposal containers.
- b. Use waste containers that are approved by the Engineer and located where they will not cause a potential hazard.
- c. Store waste containers in a temporary, fenced, secured area that is not located in a storm water runoff course, in standing water, nor on Department property. Ensure compliance with the requirements of EPA 40 CFR 264.14 and 40 CFR 264.18.
- d. Label waste containers in compliance with hazardous waste laws.
- e. Have the Contractor or his/her Consultant sample the spent materials according to the approved sampling plan referenced in [Subsection 535.1.03.D](#).
- f. Test the material using certified independent laboratory in accordance with the Toxicity Characteristic Leaching Procedure (TCLP).
- g. Collection, storage, sampling, and testing shall be performed in accordance with EPA RCRA Regulations (40 CFR 240-299).
- h. Forward a copy of all TCLP results to the Engineer and to OMR.
- i. If the TCLP toxicity test results do not classify the spent materials as a hazardous waste, uniformly blend twenty percent Portland cement with the spent materials and solidify the mixture before disposing of it at a licensed solid waste landfill. The cost of treatment and disposal of non-hazardous spent material is considered incidental to the pay item.
- j. If the TCLP test results classify the material as a hazardous waste, treat the material to the Land Disposal Restriction standard of 0.75mg/l. The waste shall not be disposed of until authorized by the Engineer.
 - 1) If the waste is to be treated on-site, submit a waste analysis plan to the regional EPA office in accordance with 40 CFR 264.13 within 30 days of receipt of the TCLP results.
 - 2) If the waste is to be treated off-site, submit TCLP results to the EPA permitted hazardous waste treatment facility.
- k. Forward a copy of all manifests and pertinent documents to the Engineer and to OMR.

9. Sampling for Lead Paint Residue

- a. Use the approved detailed sampling plan included in [Subsection 535.1.03.D, "Spent Material Sampling Plan"](#) which could either be the sampling plan listed below or a similar plan that conforms to *EPA SW 846, Chapter 9 Test Methods for Evaluating Solid Waste Physical/Chemical Methods*.

Ensure the plan includes the following:

- 1) Who will be responsible for the sampling
- 2) How often samples will be taken
- 3) How the samples will be obtained
- 4) Where the samples will be taken
- 5) How the samples will be handled

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- 6) How the sample results will be tied back to the waste from which it was sampled.
- b. Inform the Project Personnel and Independent Assurance Engineer as to when (date and time) the samples will be taken. The Department will monitor the sampling procedure and the Project Personnel will enter all pertinent information in a logbook. Information to be recorded is as follows:
 - 1) Project and Contract ID numbers
 - 2) Sampling points
 - 3) Field contact personnel
 - 4) Producer of waste
 - 5) Type of process producing the waste
 - 6) Type of waste
 - 7) Total number of samples
 - 8) Number of drums each sample will cover
 - 9) Which bridge location and the drum number i.e. 1-10, 11-18 that the sample will cover.
 - a) Label all of the drums on the project. Ensure that the labels are weatherproof and include the following:
 - The Date
 - The Project Number
 - The Contract ID Number
 - The Bridge Location
 - Assign drums a series of consecutive numbers, i.e., 1-40.
- c. Take one grab sample (using random sampling technique) from a drum for each bridge location. Use a thieving device to secure samples from each of the drums. The minimum sample size is 0.66 lb (300 g) which is about a cupful.
- d. Samples may be taken by the paint Contractor or his/her consultant who will treat the waste.
 - 1) Send the samples to a certified private testing lab.
 - 2) Attach a Sampling Analysis Request (sample card) to the samples which includes:
 - a) The Date
 - b) Project Number
 - c) Contract ID number
 - d) Bridge Location
 - e) Name of collector
 - f) Place of collection
 - g) Number of drums from Bridge each sample will cover, and
 - h) Drum numbers, i.e. 1-10, 11-18 that sample will cover.
 - 3) Include this information on the test report and the manifest so that the waste on the manifest can be keyed to the results on the TCLP report.
 - 4) Ensure that a chain of custody form accompanies the sample and is returned with the test results.
- e. Test the samples for EPA Method 1311, Toxicity Characteristic Leaching Procedure (TCLP).
- f. Test one (1) sample for each bridge location.

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- 1) If the results are 5 mg/l or greater leachable lead, the waste is to be declared hazardous and no further testing is needed until the waste has been treated. After treatment, the waste shall be re-sampled and re-tested in accordance with an approved sampling plan and shall be below 0.75 mg/l before disposal.
 - 2) If the results are below 5mg/l, the waste is to be declared non-hazardous, then the contractor or his/her consultant shall uniformly blend twenty percent Portland cement with the spent material and solidify the mixture before disposing of it at a licensed solid waste landfill.
- g. Additional samples must be acquired according to EPA SW 846 and SSPC-Guide 7 Section 5.6.5.
- h. Mail the Test reports and manifests to the Engineer's office, who will review them, take the appropriate action and send them to the lab files at the Office of Materials and Research. Send an extra copy of each to the Office of Materials and Research/Independent Assurance.

If the TCLP toxicity test results classify the spent materials as a hazardous waste, treat the waste either on-site or off-site to the Land Disposal Restriction Standard of 0.75 mg/l. Do not dispose of the waste until authorized by the Engineer. Hazardous waste material may be treated off-site if the treatment is performed by a licensed hazardous waste treatment facility in accordance with EPA and EPD guidelines. Forward a copy of all manifests and other pertinent documents to the Engineer and to OMR. These documents will be maintained in the project file for three years.

If after treatment, the spent material is classified as a hazardous waste by the TCLP test, retreat it until the Universal Treatment Standard is met. Hazardous waste disposal shall be paid for as specified under [Subsection 535.5 "Payment"](#), of this Specification.

10. Handle hazardous waste as follows:

- a. Comply with [Section 107](#) of the Specifications. The Contractor is responsible for complying with the hazardous waste laws when performing the Work. Obtain a separate United States Environmental Protection Agency, Generator I.D. Number for each project where the spent material is hazardous waste according to the Toxicity Characteristic Leaching Procedure (TCLP) results.

Obtain the generator I.D. number from the Georgia Environmental Protection Division, Hazardous Waste Management, (404) 656-2833.

Obtain the Generator I.D. Number within 30 days of receiving the TCLP results and provide copies of the number to the Project Engineer and the Office of Maintenance, Bridge Inspection Unit, No. 2 Capitol Square, Atlanta, Georgia 30334.

- b. Dispose of hazardous spent material only at a licensed hazardous waste disposal facility.
- c. If the disposal facility requires it, send a sample of spent material for confirmation testing before delivering the shipment.
- d. Transport the waste to the facility using EPA-approved licensed waste haulers.
- e. Document each truckload of hazardous waste using an EPA "Uniform Hazardous Waste Manifest."
- f. According to EPA and EPD rules, provide GDT and the Georgia EPD notification and certification of treated hazardous spent abrasives. Include the following:
- Name and address of facility receiving the shipment Description of the waste as initially generated, including the applicable EPA Hazardous Waste Number(s) and treatability group(s)
 - Treatment standards applicable to the waste at the initial generation point
 - Signature of an authorized Contractor representative on the certification
- g. Hazardous waste disposal is paid for as specified under [Subsection 535.4.01.A, "Spent Materials."](#)

C. Clean Structures Under or Over Railroads

When cleaning and painting steel structures involves work on, over, or below the railroad right-of-way or the property of a railroad company (Railroad), comply with the following:

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- The additional requirements, including railroad flagging and insurance coverage, listed in the Special Provision for Protection of Railway Interests
- The Railroad’s general rules, regulations, and requirements including those on safety, fall protection, and personal protective equipment

Coordinate the work with the Railroad and ensure that there will be no interference with or delay to Railroad operations, including train, signal, and communication services.

1. Railroad Protection Requirements

The Contractor is responsible for damages to vehicles, persons, or property resulting from cleaning operations. Ensure that the facilities and property of the Railroad or any tenants remain undamaged.

Comply with the following:

- a. Protect the following from the damages of blast-cleaning operations:
 - Traffic (pedestrian, vehicular, rail, train, and other kinds of traffic) on, under, or next to the structure
 - Portions of the structure (superstructure, substructure, and highway appurtenances) that could be damaged
- b. Weight or anchor ground cloths to withstand the suction effects of a passing train.
- c. Restrain ropes, hoses, tarps, booms, and other equipment so they do not hang from the bridge or otherwise infringe on the clearances around an active track (see [Subsection 535.3.03.C.2, “Railroad Construction Clearance Limits,”](#) below). Account for the following:
 - Wind billowing of draped tarpaulins
 - Sag from the weight of collected spent materials

2. Railroad Construction Clearance Limits

Comply with the Railroad Construction Clearance Limits:

Railroad Construction Clearance Limits		
Track Type	Horizontal Limits	Vertical Limits
Single Track	25 ft (8 m) from the center line	The existing vertical clearance from the top of the rail to the underside of the bridge
Multiple Tracks	25 ft (8 m) from the center lines of the outermost tracks	The existing vertical clearance from the top of the rail to the underside of the bridge

3. Requirements on Bridges Carrying Roadways Over Railroad Tracks

When work is required within the Railroad Construction Clearance Limits, ensure that the following can be moved outside the clearance limits when the Railroad flagman notifies you to clear the track for rail traffic.

- Working platforms
- Scaffolding
- Containment systems
- Other equipment necessary to complete the Work

While the track is open to rail traffic, do not allow ropes, hoses, tarps, booms, or other equipment or items to hang from the bridge or infringe on the clearance limits.

4. Requirements on Bridges Carrying Railroad Tracks over Roadways

When work is required on the Railroad bridge, ensure that the following can be moved completely off the bridge when the Railroad flagman notifies you to clear the track for rail traffic.

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- Working platforms
- Scaffolding
- Containment systems
- Other equipment necessary to complete the Work
- Spent material

Do not attach rigging or other items to the bridge rails or barriers at the sides of the bridge.

While the track is open to rail traffic, do not allow ropes, hoses, tarps, booms, or other equipment or items to remain on the bridge.

D. Prepare Steel Piling, Swaybracing, and Concrete Piling Surfaces for Special Protective Coatings

Prepare surfaces and material for special protective coatings according to the manufacturer's recommendations. For a list of sources, see [QPL 18](#).

535.3.04 Fabrication

General Provisions 101 through 150.

535.3.05 Construction

A. Provide Protection

Protect the structure, adjoining property, and the public from the dangers and damages of cleaning and painting.

Protect the following:

- Pedestrian, vehicular, and marine traffic on or underneath the structures being painted
- Structures
- Slope paving

Clean slope paving stained during painting to the Engineer's satisfaction.

B. Meet General Painting Requirements

Follow these requirements when painting new and existing steel structures:

1. Weather Conditions

Cleaning or Painting shall not take place during windy or gusty conditions unless the contractor can demonstrate to the satisfaction of the Engineer that containment is sufficient to prevent the escape of paint overspray or spent material. If any paint overspray or spent material is detected outside containment areas, cease all operations until clean up has been completed. Do not recommence cleaning or painting operations until additional measures have been taken to prevent any future escape of spent material and/or paint overspray.

When the Plans specify System VI (waterborne), ensure that the minimum air and surface temperature is 50 °F (10 °C). Comply with the other weather requirements listed below.

When the Plans specify System VII, ensure that the minimum air and surface temperatures are above 35 °F (2 °C) and the relative humidity is greater than 50% when applying the inorganic zinc primer. Apply System VII waterborne intermediate and top coats only when the temperatures of both the air and surface are above 50 °F (10 °C).

For Systems IV and V (alkyd), apply paint only when the air and surface temperatures are both above 40 °F (4 °C).

Weather Requirements for Painting All Systems
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Maximum surface temperature	140 °F (60 °C)
Relative humidity	Below 85%
Minimum surface temperature	5 °F (3 °C) above dew point

Follow these weather restrictions:

- Do not apply paint to surfaces that are damp or otherwise unsatisfactory as determined by the Engineer.
- Do not paint in open yards or on erected structures when the metal is hot enough to cause the paint to blister or produce a porous film.
- Do not paint metal hot enough to cause oil separation in the alkyd paint.
- Do not paint metal when freezing weather 32 °F (0 °C) is forecast or expected before the paint can dry.
- Do not store at temperatures below 32 °F (0 °C) or above 100 °F (38 °C). When outdoor temperatures exceed these limits, paint shall be stored in an appropriate indoor location.

2. Oxidation

If a prime coat on structural steel fades or chalks because of oxidation, thoroughly remove the oxidation by brushing or by washing with water until the sound prime coat is visible.

3. Paint Thinning

Do not thin or dilute paints.

4. Application Methods

Thoroughly mix paints in their shipping containers using mechanical devices before removing the paint.

For inorganic zinc primers, add the powder component to the liquid component with thorough stirring, and continue stirring until the powder is well dispersed. Strain the mixture through a 30-60 mesh sieve to remove large particles. Use pressure pots equipped with a mechanical agitator, which will remain in motion throughout the application.

Ensure that the paint formulation matches the application method (brush, roller, airless spray, or air spray).

Apply paint neatly by brushing, spraying, or rolling. Use rollers only as specified in [Subsection 535.3.02.C](#), “Rollers.”

When using brushes or rollers, apply the paint as follows:

- Produce an even coating covering the metal or the previous coat.
- Work the paint into corners and crevices.
- Keep enough paint on rollers and overlap the applications to avoid unsightly or mottled areas.

Use the paint numbers shown in the Table of Application Methods, below.

Table of Application Methods			
Brush	Roller	Airless Spray Hydraulic	Air Spray
Ordinary Exposure Green System IV (Lead Free Alkyd)			
1A	1A	1A	X
1A	1A	1A	X
2A	2A	2A	X
3B	3B	3B	X
X	X	X	X

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Table of Application Methods			
Brush	Roller	Airless Spray Hydraulic	Air Spray
Heavy Exposure Green System V (Lead Free Alkyd)			
1A	1A	1A	X
1A	1A	1A	X
1A	1A	1A	X
2A	2A	2A	X
3B	3B	3B	X
Ordinary Exposure Green System VI (Waterborne)			
1W	1W	1W	1W
1W	1W	1W	1W
2W	2W	2W	2W
3W	3W	3W	3W
Ordinary exposure Green System VII (Zinc Primer)			
X	X	Inorganic Zinc Primer	X
2W	2W	2W	2W
3W	3W	3W	3W

5. **Paint Systems and Dry Film Thickness**

Apply the minimum required dry film thickness and the additional coats according to the paint system required on the Plans.

Table of Paint Systems and Minimum Required Dry Film Thickness		
No. of Coats	Color of Coats	Thickness, mils (mm)
Ordinary Exposure Green System IV (Lead Free Alkyd)		
Primer	Red	2.0 (0.051) to 5.0 (0.127)
Touch-Up	Red	*
2nd Coat	Buff	2.0 (0.051) to 5.0 (0.127)
3rd Coat	Green	1.0 (0.025) to 3.0 (0.076)
4th Coat	None	X
Heavy Exposure Green System V (Lead Free Alkyd)		
Primer	Red(T)	2.0 (0.051) to 5.0 (0.127)
Touch-Up	Red	*
2nd Coat	Red	2.0 (0.051) to 5.0 (0.127)
3rd Coat	Buff	1.5 (0.038) to 5.0 (0.127)

Table of Paint Systems and Minimum Required Dry Film Thickness		
No. of Coats	Color of Coats	Thickness, mils (mm)
4th Coat	Green	1.0 (0.025) to 3.0 (0.076)
Ordinary Exposure Green System VI (Waterborne)		
Primer	Brown	3.0 (0.076) to 5.0 (0.127)
Touch-Up	Brown	*
2nd Coat	Buff or White	3.0 (0.076) to 5.0 (0.127)
3rd Coat	Green	3.0 (0.076) to 5.0 (0.127)
4th Coat	None	X
Ordinary Exposure Green System VII (Zinc Primer)		
Primer	Gray	3.0 (0.076) to 5.0 (0.127)
2nd Coat	Buff or White	2.0 (.0.051) to 5.0 (0.127)
3rd Coat	Green	2.0 (0.051) to 5.0 (0.127)
4th Coat	None	X
* = 2.0 (0.051) for touch-up coats (T) = Tinted		

6. Proper Drying

Ensure that each coat is thoroughly dry and cured before applying the next coat. Allow at least 24 hours between coats.

If weather conditions and paint type require, allow longer periods between coats.

7. Cracks and Cavities

Before applying the second field coat, fill small cracks and cavities that are not sealed watertight by the first field coat using the following

Plan-Required Paint System	Fill Mixture
IV or V	Pasty mixture of zinc hydroxy phosphite and linseed oil
VI	Pasty mixture recommended and supplied by the manufacturer
VII	Pasty mixture recommended and supplied by the manufacturer

C. Paint New Steel Structures

Paint new steel structures as follows:

1. Use the correct paint system. The Plans usually specify one of the systems shown in the [Table of Paint Systems and Minimum Required Dry Film Thickness](#). If the Plans do not specify a paint system, use System VI.

If the structure is located in the 13 county ozone non-attainment region, use only Waterborne coatings for any painting operation conducted between May 1 and September 30. The 13 metro Atlanta counties that comprise the non-attainment region are: Cherokee, Clayton, Cobb, Coweta, DeKalb, Douglas, Fayette, Forsyth, Fulton, Gwinnett, Henry, Paulding, and Rockdale. Do not apply Alkyd coatings and the System VII inorganic zinc primer under the above conditions. System VI and the System VII waterborne intermediate and top coats may be applied.

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2. Paint new structural metal with one shop prime coat, one field touch-up coat, and two field weather coats. When severe exposure conditions require, apply one additional prime coat. Once painting has commenced, (including shop coat) succeeding coats of paint are to be the same paint system and from the same paint manufacturer.

8. Apply the type and color of paint coats as required by the system number shown on the Plans.

If succeeding coats are the same type and color, tint one of the underlying coats as required by [Subsection 870.2.01.B.1.d](#) and [Subsection 870.2.06.A.6](#).

9. Do not paint advertising on structural steel.

10. Adhere to the following requirements for special surfaces:

a. Concrete Contact Areas

If the following surfaces will touch previously poured and hardened concrete, apply two coats of primer to them:

- Steel surfaces
- Nongalvanized handrail posts
- Nonembedded armored joints

Unless otherwise specified on the Shop Drawings, do not shop paint surfaces that will touch plastic concrete.

b. Inaccessible Areas

Before assembly, paint surfaces that will be inaccessible after assembly or installation with two coats of primer.

c. Connection Areas

Do not shop paint the following connection areas:

- Surfaces that will touch after welding or bolting
- Areas next to field welds

d. Machine-Finished Surfaces

Using the materials specified, either shop paint or coat the machine-finished surfaces according to [Subsection 501.3.04.D.9, “Coating Machine-Finished Steel Surfaces.”](#)

e. Plates That Touch Elastomeric Pads

Apply one coat of the shop primer specified on the Plans to plates that will touch elastomeric bearing pads.

- 1) Paint surfaces and edges that will be exposed after components are erected.
- 2) Do not apply the primer paint to areas that will be welded.
- 3) Do not apply the primer paint to the area that will bear against the elastomeric pad.
- 4) Dimension and locate the blocked-out, no-paint areas to within plus or minus 1/2 in (13 mm) of the theoretical location and size of the elastomeric pad.

11. Do not handle or load steel until the shop paint is dry.

12. Field paint steel surfaces according to this time line:

a. Before Erection

If the following surfaces will touch previously poured and hardened concrete, touch them up as required with primer (or apply two coats of primer if the item was not shop painted) before installing them:

- Steel surfaces
- Nongalvanized handrail posts
- Nonembedded armored joints

Do not install until the paint is thoroughly dry.

b. After Erection

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After completing steel erection, clean unprimed surfaces of connection areas requiring paint as specified in [Subsection 535.3.03.A](#), “Clean New Steel Structures,” [step 3](#).

Connection areas include welded or bolted splices, beam and diaphragm connections, and bracing connections. Prime connection areas with the paint specified in the system number shown on the Plans.

Do not prime welded connections until the following occurs:

- Weld metal is cleaned according to [Subsection 501.3.04.I.2](#), “[Paragraph 3.10.1](#),” and [Subsection 501.3.04.I.3](#), “[Paragraph 4.30.1](#).”
- Radiographic or magnetic particle inspection work, if specified, is complete and the welds are approved.

c. After Concreting

After completing concreting work, clean surfaces as specified in [Subsection 535.3.03.A](#), “Clean New Steel Structures,” and field paint as follows:

- 1) Cover the following with one coat of touch-up primer paint and allow it to dry:
 - Shipping and erection marks
 - Bolt heads
 - Other surfaces with worn off or defective prime coat
- 2) During touch up, stripe or paint the following with an additional coat of primer:
 - Exposed edges of flanges on rolled beams and built-up girders
 - Edges of angles and stiffeners
 - Exposed edges of gusset plates, splice plates, and cover plates
- 3) Ensure that sharp, exposed edges have two full coats of primer paint, including the shop coat.
- 4) If removing oxidation as described in [Subsection 535.3.05.B.2](#), “[Oxidation](#),” damages the prime coat so that bare metal is exposed after cleaning, prime the exposed bare metal with an additional coat at no expense to the Department.
- 5) If removing oxidation reduces the prime thickness, use two field weather coats, if desired, to obtain the total thickness required for the paint system.

However, when the two field weather coats are different types of paint, use additional prime paint to obtain the prime thickness.

D. Paint Existing Steel Structures

Paint existing steel structures as follows:

1. Prevent paint overspray by using containments.
2. The weather conditions specified for new steel structures described in [Subsection 535.3.05.B](#) also apply to existing steel structures.
3. Apply the correct colors and number of coats as follows:

Only steel which has undergone complete removal of all coats and which has a surface cleanliness conforming to SSPC SP-6 may be coated with System VI.

Give this steel one full prime coat and two weather coats, all of the color and type required by the Special Provisions or Plans. If succeeding coats are of the same type and color, tint one of the underlying coats-as required by the Specifications.

4. The drying requirements of [Subsection 535.3.05.B.6](#) specified for new steel structures shall apply to existing steel structures.
5. The paint thinning requirements of [Subsection 535.3.05.B.3](#) specified for new steel structures shall apply to existing steel structures.

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6. Painting Of Surfaces:
 - a. Methods Of Application: The requirements of [Subsection 535.3.05.B.4](#) as specified for new steel structures shall apply to existing steel structures.
 - b. Cracks And Cavities: The requirements of [Subsection 535.3.05.B.7](#) as specified for new steel structures shall apply to existing steel structures.
 - c. Paint Thickness: The minimum required dry film thickness as specified in [Subsection 535.3.05.B.5](#) and the additional coats specified in [Subsection 535.3.05.B.5](#) for new steel structures shall apply to existing steel structures. However, when new paint is applied over existing sound paint, the required wet film thickness of the new coats shall be that required by the Special Provisions or Plans.
7. Apply the minimum required dry film thickness and the additional coats specified in the [Table of Paint Systems and Minimum Required Dry Film Thickness](#).

However, when applying new paint over existing sound paint, comply with the required wet film thickness specified by the Special Provisions or Plans for new coats.
8. After completing the painting, replace the railings, name plates, and other interfering parts removed (as described in [Subsection 535.3.03.B](#), “Clean Existing Steel Structures” [step 2.a](#)) to the Engineer’s satisfaction.

E. Paint Steel H-Piling, Metal Shell Piling, and Steel Swaybracing

Paint this material as follows:

1. Weather Conditions

Except as specified below, apply paint in the weather conditions specified in [Subsection 535.3.05.B.1](#), “Weather Conditions.”

- a. Painting in open yards or on erected structures shall not be done when the metal is sufficiently hot to cause the paint to blister or produce a porous film.
- b. Metal shall not be painted when freezing weather [32 °F (0 °C)] is forecast or expected in the time that would occur before the paint has dried.

2. Thinning Paint

Do not thin or dilute pile paints.

3. Number of Coats and Color

Unless the Plans require a No. 1P or 2P system, described in [Subsection 870.2.05.A.1](#), “Paint for Steel Piling and Swaybracing,” paint steel H-piling, metal shell piling, and steel swaybracing with a System VII paint system.

Apply a No. 1P system as follows:

- a. When using a No. 1P system formulated as a first application primer and a separate finish coat, ensure that containers are clearly labeled as primer or finish coat.
- b. Apply the primer first.
- c. Apply successive coats using either primer or finish coat.
- d. Ensure that the final coat is a finish coat

4. Method of Application

Apply the black paints noted in [Subsection 535.3.05.E.3](#), “[Number of Coats and Color](#)” using either brushes or sprayers.

When using a brush, apply the paint as follows:

- a. Apply a thick application of paint to be plastered or troweled on the steel surfaces.
- b. Brush out the paint only as required to obtain uniform thickness; do not attempt to brush it out neatly.
- c. Work the paint into corners and crevices.

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5. Application Rate

For each coat, apply at least 1 gal of paint type per 60 ft². (0.7 L/m²). Ensure that the total dry-film thickness of paint coats is as specified in [Subsection 535.3.05.E.6, “Thickness of Paint.”](#) below.

6. Thickness of Paint

Ensure that the final, dry-film thickness of the completed work is at least 25 mils (0.635 mm).

Apply additional coats to achieve the minimum dry-film thickness at no expense to the Department.

7. Extent of Paint

Paint to the following extent:

- Coat exposed piling with a System VII paint system unless a No. 1P or No. 2P system is specified on the Plans.
- Coat piling in the stream bed and within 10 ft (3 m) of the top of the stream bank with the System VII from 5 ft (1.5 m) below the stream bed to the bottom of the concrete cap.
- Coat end bent piles 2 ft (600 mm) below the bottom of the cap or concrete encased as defined in [Subsection 520.3.05.O, “Coat and Paint Piling.”](#)
- For piling that will be encased according to [Section 547](#), paint the piling with System VII to the extent specified in [Subsection 520.3.05.O, “Coat and Paint Piling.”](#)
- Before driving, coat test piles located in permanent surface water with a System VII according to [Subsection 520.3.05.O, “Coat and Paint Piling.”](#)

Paint enough of the test pile to ensure that the coated portion extends 5 ft (1.5 m) below the stream bed or bottom.

8. Drying Requirements

Ensure that each coat is thoroughly dry before the next coat is applied.

F. Apply Special Protective Coatings to Steel Piling, Steel Swaybracing, and Concrete Piling

Unless the Plans require No. 1P or 2P system, apply a System VII coating. Apply the coating to the extent specified in [Subsection 520.3.05.O, “Coat and Paint Piling.”](#)

Ensure that coverage, wet- and dry-film thicknesses, temperature considerations, primer use, and drying and curing time comply with the manufacturer’s recommendations.

Apply the special protective coating as follows:

1. When the structure will be welded, do not apply the material until the weld is placed and cleaned.
2. Apply the material in at least two coats by brushing.
3. Apply the second coat at right angles to the first coat.
4. Use the elapsed time between coats recommended by the manufacturer.
5. Ensure that the finished film has no holidays and pinholes and completely covers the underlying surface.
6. After applying the coating material, recoat damaged areas where the protection is ineffective as determined by the Engineer.
7. Where swaybracing members will be welded to piles and painted in advance, burn off the coating at the weld location and proceed as follows:
 - a. Thoroughly clean the burned area by scraping and power-operated wire brushing before welding.
 - b. After making and cleaning the weld, recoat the area.
8. Do not drive piles painted in advance until the second coat has thoroughly dried and completely cured.

535.3.06 Quality Acceptance

A. Correct Defective Work

If applied paint does not meet the requirements of this Specification, remove the paint or correct it using SSPC-approved means.

Remove paint that is applied to improperly cleaned surfaces. Clean the surfaces and repaint them to the Engineer's satisfaction.

B. Meet the Required Total Dry-Film Thickness

If the minimum required total dry-film thickness specified for the paint system is not reached after applying the required number of coats and colors, apply additional coats at no expense to the Department until the required thickness is obtained.

The Department considers the applied zinc primer deficient in thickness for measured dry thickness values less than 3 mils (0.076 mm). If more than four deficient thickness values (one measurement per 25 ft.² (2.32 m²) of surface area) are found in any 200 ft² (18.6 m²) of continuous metal section, blast clean the entire section to a SSPC-SP6, Commercial Blast condition. Repaint the section with inorganic primer to achieve a dry film coating thickness of 3.0 to 5.0 mils (0.076 to 0.127 mm).

Repair primed areas having excessive dry film coating thickness, coating "dry spray", visible coating "mudcracking", visible surface hackles, handling abrasions, and missed paint in bolt holes. Repair in accordance with the written recommendations of the paint manufacturer. Obtain the Engineer's approval for all repair recommendations. Include current product data and application instruction sheets with the repair recommendations.

535.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

535.4 Measurement

The cost of painting new steel structures shall be included in the Contract Price for structural steel. No separate payment will be made.

Cleaning and painting existing steel bridge structures will be measured and paid for at the Contract Unit Price for "Painting Existing Steel Structure Station or Bridge I.D. No. ____." This includes payment for the following:

- Equipment (including a "flotation device" or temporary platform on waterway bridges)
- Work platform
- Bucket truck or snooper truck with safety belt
- TCLP testing
- Materials and work necessary to remove lead-based paint and contain the spent materials
- Collection and storage of spent materials, water, and slurry generated by abrasive blasting

535.4.01 Limits

A. Spent Materials

Treatment of hazardous waste and subsequent disposal shall be paid for under a force account basis. The Engineer will reimburse the Contractor based upon invoices from the licensed hauler and disposal facility. An additional amount equal to 3% of the total invoices will be paid as administrative costs incurred by the Contractor.

The costs of collecting spent material, furnishing the containers, loading the material into containers, treating the material onsite, and loading the containers into the licensed hauling unit will not be paid for separately. These costs are considered incidental to the pay item.

The disposal of other spent materials collected is incidental to the Pay Item "Painting Existing Steel Structures."

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B. Piling and Steel Swaybracing

The cost of applying special protective coatings or paint to piling shall be included in the Contract Price for piling. No separate payment will be made.

The cost of applying special protective coatings or paint to steel swaybracing shall be included in the Contract Price for structural steel. No separate payment will be made.

535.5 Payment

Payment is full compensation for the costs, direct and indirect, of complying with the requirements of this Specification.

Payment will be made under:

Item No. 535	Painting existing steel structure, Station No. ____	Per lump sum
Item No. 535	Painting existing steel structure, Bridge I.D. No. ____	Per lump sum
Item No. 535	Painting existing steel structures, Railroad Special, Station No. _____	Per lump sum
Item No. 535	Painting existing steel structures, Railroad Special, Bridge I.D. No. _____	Per lump sum

535.5.01 Adjustments

General Provisions 101 through 150.